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UNDERGROUND GUN MARKETS*

Philip J. Cook, Jens Ludwig, Sudhir Venkatesh and Anthony A. Braga

This article provides an economic analysis of underground gun markets, drawing on interviews with gang members, gun dealers, professional thieves, prostitutes, police, public school security guards and teenagers in the city of Chicago, complemented by results from government surveys of recent arrestees in 22 cities, plus administrative data for suicides, homicides, robberies, arrests and confiscated crime guns. We find evidence that transactions costs are considerable in the underground gun market in Chicago, and to some extent in other cities as well. The most likely explanation is that the underground gun market is both illegal and 'thin' – relevant information about trading opportunities is scarce due to illegality, which makes search costly for market participants and leads to a market thickness effect on transaction costs.

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This topic is of interest in part because of the high rate of gun violence in the US. Despite a dramatic decline in crime during the 1990s America still has a homicide rate that is about four times as high as in England and Wales (FBI, 2005, Cotton and Bibi, 2005). Because firearms are involved in 70% of all American homicides but fewer than 10% of those in England and Wales, the difference in overall homicide rates is largely accounted for by gun homicides. The total social cost of gun violence in the US is estimated to be in the order of $100 billion per year (Cook and Ludwig, 2000).

Underground gun markets have developed in the US in response to federal regulations that seek to prohibit ownership and possession by that sub-set of the population deemed to be at unacceptably high risk of misusing guns – primarily youth and adults with serious prior criminal records – while preserving easy access for everyone else.

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[1] Most of what is known about the underground gun market comes from interviews with incarcerated prisoners or inner-city youth (Wright and Rossi, 1994; Webster *et al.*, 2002; Sheley and Wright, 1993; Callahan and Rivara, 1992; Hales *et al.*, 2006). However such interviews can at best shed light on how a subset of the retail market operates and are not informative about other aspects of market structure or conduct.

Whether the gun market can be segmented in this way remains the topic of spirited debate in policy circles. In Section 1 we review this regulatory system and note that a few jurisdictions, including Chicago, go further and essentially prohibit the private possession of handguns, the type of gun most commonly used in crime and violence. The fact that Chicago has unusually restrictive regulations makes the city an interesting case study of what difference government regulations can make; it also makes for an interesting comparison with the restrictive regimes of Britain and other Western nations, although there is little systematic research on the functioning of underground gun markets anywhere.[2]

Economists and other sceptics like to point out that government prohibitions on transactions are difficult to enforce; the ingenuity of the marketplace, motivated by profit, will overcome whatever legal obstacles are put in place. If true for handguns in Chicago, then we would expect to find that youths and criminals are able to acquire them with little trouble (low transaction costs) at prices not that much higher from those in the legal market. As New York University law professor James Jacobs observes in this regard, 'Some criminals claim that it is as easy to buy a gun on the streets as it is to buy fast food. One Chicago gang member stated, "It's like going through the drive-through window. Give me some fries, a Coke, and a 9-millimeter."'[3]

The first contribution of our article is to establish the existence of substantial transaction costs in the underground gun market, based on a series of in-depth ethnographic interviews conducted in two high-crime neighbourhoods on Chicago's South Side by a member of our research team (Sudhir Venkatesh, hereafter SV). In Section 2 we document large mark-ups over legal prices, search costs, a high rate of uncompleted transactions and substantial physical risk and uncertainty about gun quality. These findings stand in stark contrast to both standard economic intuition and the prevailing common wisdom about gun markets in the US.

We argue in Section 3 that the most likely explanation for these transaction costs is the fact that the gun market is both illegal and 'thin', that is, has few buyers and sellers. The illegality of the gun market increases search costs for prospective trading partners. Diamond (1982) notes that in this type of trading environment there can be a market 'thickness effect' on transaction costs.

In Section 3 we also consider four types of explanations for why the gun market is thin: police; gangs; neighbourhood-specific factors such as attitudes towards guns in high-poverty, high-minority urban areas; and city-specific factors such as Chicago's ban on handguns. We find that law enforcement activities appear to matter more in suppressing supply in the gun market than in other underground markets, such as those for drugs, in part because the street gangs that are well positioned to deal in guns avoid doing so for fear of attracting police attention, thereby jeopardising the profits associated with the more lucrative drug trade. There is a possibility that the underground gun market in SV's neighbourhoods differ from other Chicago neighbourhoods, but we show that there is more similarity than difference, at least with respect to the dimensions we can measure from administrative and survey data.

[2] A partial exception is due to the recent study for the Home Office, which sought information on criminal access to guns in Britain through interviews with 80 people imprisoned for firearms offences (Hales *et al.*, 2006).

[3] Jacobs' quote is taken from Don Terry, 'How criminals get their guns: in short, all too easily', *The New York Times*, March 11, 1992, p. A1.

We have no direct test of the influence of Chicago's handgun ban in reducing gun availability but demonstrate that it was ineffective in reducing the prevalence of gun ownership in the city. The frictions we observe in the underground market are more likely due to the general scarcity of guns in the city (gun ownership rates are quite low, a fact that predates the ban) and on Chicago's emphasis on anti-gun policing. But even in cities with more guns and less enforcement, our analysis of multi-city survey data of arrestees indicates that many criminals find it difficult to obtain one.

From a social welfare and policy perspective we are also (or perhaps especially) interested in the question of whether friction in the underground gun market winds up influencing gun involvement in crime. Section 4 reviews evidence suggesting an affirmative answer. We discuss the limitations and implications of these findings, and directions for future research, in Section 5.

1. Regulations on Gun Markets in the US

The underground market in the two neighbourhoods studied by SV and in Chicago more generally is shaped by the legal framework that regulates gun ownership and transactions. The prevalence of guns in private hands is also relevant, since one source of guns to underground transactions is the existing stock.

1.1. *Regulatory Framework*

The 1968 Gun Control Act (GCA) requires everyone 'engaged in the business' of selling guns to obtain a federal firearms license (FFL). Since 1994, all FFLs have been required by either the federal Brady Act or more restrictive state laws to conduct background checks to verify the eligibility of prospective gun buyers (Ludwig and Cook, 2000). Private owners who are not 'engaged' in the gun business are not required to obtain a FFL. The only federal restriction on these sales is that the seller cannot knowingly provide a gun to someone prohibited by law from having one (Cook *et al.*, 2005; Vernick and Hepburn, 2003).[4]

Under the regulatory system established by the GCA states are allowed to impose additional restrictions on gun transactions beyond those required by federal law. For example several states require that all guns be registered with the authorities or that all gun owners obtain state licences, or both (Vernick and Hepburn, 2003). These requirements are intended to provide officials with some way of tracking – and thus regulating – secondary market gun sales.

1.2. *Diversions from Legal to Illegal Hands*

Nationwide, few criminals get their guns directly from licensed gun dealers (Wright and Rossi, 1994). But the legal market for guns and legal ownership patterns affect supply in the underground market through theft. With somewhere between 200 and

[4] The Federal Gun Control Act bans possession by a number of categories of individuals, including convicted felons, those under indictment, and those convicted of a domestic violence offence. Individuals under age 18 are barred from possession of a handgun unless under supervision.

250 million guns in private hands in the US, many of which are stored unlocked in order to be readily available for use against criminal intruders, it is not surprising that a large number of guns (over 500,000) are stolen each year (Cook and Ludwig, 1996).

Another source of guns for the underground economy consists of unregulated secondary market sales, estimated to be on the order of 2 to 3 million per year (Cook and Ludwig, 1996). Organised gun shows appear to account for just a small share of all secondary market transactions, including those involving criminals (Wright and Rossi, 1994; Cook and Ludwig, 1996). In addition to secondary market sales, guns may be loaned out among friends and relatives.

A final way in which guns wind up in the hands of criminals is when a legal owner 'converts' into a criminal. Most gun crime in the US is accounted for by people not legally allowed to have guns (Cook and Laub, 1998, Cook *et al.*, 2005). However there is still a non-trivial amount of gun violence committed by adults who legally owned guns before using them in crime.

1.3. *Chicago's Regulatory Environment*

Chicago provides a particularly interesting case study for understanding underground gun markets because the city has unusually restrictive firearm regulations. The city is located in the state of Illinois, which requires all gun owners to obtain a Firearm Owners ID card and bans private transfer of a gun to anyone lacking such a card. Chicago itself goes still farther; since 1982 it has essentially banned handguns except those already in circulation that were then registered with the city. Furthermore, there are almost no legal firearms retailers operating in the city, so that a private citizen seeking to buy a firearm of any sort must travel outside of city limits. (Mailorder purchases of firearms is banned by federal law.)

In a sense Chicago's gun regulations and its relatively low rate of gun ownership are more akin than most American jurisdictions to those of other western nations. The prevalence of gun ownership, particularly of *hand*guns, is much higher overall in the US than any other high-income country, and its national regulations on gun transactions and possession are weaker (Hemenway 2004, p. 197–8; Killias *et al.* 2001). The Chicago ban on handguns has a particular parallel in the handgun ban and buyback in Britain following the Dunblane massacre (Leitzel, 2003).

2. Underground Gun Markets in the Chicago Ghetto

The underground gun market in the Chicago neighbourhoods we study is characterised by substantial transaction costs, by which we mean large mark-ups over legal prices, substantial search times, uncertainty about product quality, and the physical risk associated with exchange. This finding stands in stark contrast to prevailing common wisdom about how these markets operate.

2.1. *Study Neighbourhood*

Our study draws on uniquely detailed data about underground gun markets derived from SV's intensive field interviews conducted in the high-crime community in South

Side Chicago known as Grand Boulevard/Washington Park (hereafter GB/WP). The selection of this site is partly pragmatic, given the proximity to SV's initial academic home (the University of Chicago). However this area is also of particular interest given that gun crime in America is disproportionately concentrated in large cities and within these cities occurs disproportionately in highly disadvantaged neighbourhoods.

The target community is a large contiguous swatch of poor and working-class neighbourhoods in the South Side of Chicago that forms the heart of the 'Black Metropolis', Chicago's oldest African-American settlement. The community has become a space of considerable gentrification and economic development, thereby combining extremely poor city blocks – including the site of the notorious Robert Taylor Homes public housing project – with blocks of middle-class homeowners.[5] Despite these recent changes, data from the 2000 Census show that residents of the community are still mostly African-American and much more disadvantaged than other residents of Chicago or the US as a whole (Table 1). The homicide rate in the GB/WP area is about 75% higher than in the city of Chicago overall and is about 6 times the national rate.[6]

SV's interview samples are defined by age and criminal involvement, as well as role in the underground gun market.[7] His goal was to ensure that each 'type' of neighbourhood resident is represented in the study but the particular set of individuals interviewed within each type is essentially a convenience sample. Interviews were conducted with 190 non-gang affiliated youths aged 18–21, of whom 116 owned a gun, and 75 gang-affiliated youths, whose access to guns is usually under control of the gang leadership.[8] SV also interviewed 90 non-gang affiliated adults, of whom around 45 owned a gun; and 57 gang-affiliated adults (including 12 gang leaders), of whom 50 owned a gun. In addition SV interviewed 12 elite gun suppliers (importers or wholesalers), 11 retail brokers, 17 adults engaged actively with criminal associations, and 77 prostitutes.

2.2. *Characteristics of the Underground Gun Market*

2.2.1. *Gun demand*

What motivates the demand for guns in the GB/WP area? SV's younger informants typically seek guns for the status they confer, rather than as inputs into a crime production function. With status goods economists sometimes refer metaphorically to

[5] The physical infrastructure of the area is changing dramatically because of public housing demolition and heightened gentrification. Given these changes we focus only on gun markets apart from public housing, given that any in-depth findings on public housing-based gun use and trading would soon be outdated.

[6] The Greater Grand Boulevard area consists of three 'community areas', the official administrative unit that sub-divides Chicago: Oakland, Grand Boulevard and Washington Park, which in 2003 together had 17 homicides and a population of 48,262 (Chicago PD Annual Report, 2003).

[7] Sample size is a somewhat imprecise concept with ethnographic fieldwork, since for example some of these discussions might be held informally with a group in an apartment building hallway. We try to count 'respondents' only as those with whom SV had a reasonably lengthy one-on-one discussion. There is also some ambiguity about people's roles within the neighbourhood; for example SV's definitions of 'gang affili ated' may not correspond to those used by the Chicago Police Department.

[8] Note human subjects requirements prevented SV from interviewing minors, so all respondents are 18 or older.

Table 1

Selected Demographic Characteristics for Grand Boulevard/Washington Park Field Site Neighbourhoods versus Chicago and US

	Grand Boulevard/Washington Park*	Chicago	US
Percentage under age 20	39.8	29.0	28.6
Race:			
% White	0.6	42.0	75.1
% Black	98.2	36.8	12.3
% Asian	0.1	4.3	3.6
% Hispanic (any race)	0.9	26.0	12.5
Schooling of adults ages 25 and over:			
% > = high school	61.0	71.8	80.4
% > = BA	8.7	25.5	24.4
Marital status of people 15 and over:			
Never married	50.9	40.9	27.1
Divorced	10.4	8.8	9.7
% adults 16 and over in labour force	48.4	61.3	63.9
% people poor	48.5	19.6	12.4
2003 homicide rate per 100,000	35.2	20.5	5.7

Notes. *Grand Boulevard consists of census tracts 3801–3820, while Washington Park consists of census tracts 4001–4008. Demographic and housing characteristics from 2000 Census. 2003 Homicide rate calculated for Chicago and GB/WP neighbourhoods from Chicago PD (2003), and for US from the FBI's Crime in the United States report.

'arms races', but in the market for guns among young people there seems to be a literal arms race at work. As one young gang member notes, in the absence of having a gun: 'Who [is] going to fear me? Who [is] going to take me seriously? Nobody. I'm a pussy unless I got my gun.'

Just showing rather than actually firing guns is usually sufficient for the purposes of achieving the desired result. As one youth noted, 'You have to let [other people] see it without letting them see it. See, it's all about them not messing with you.' As another youth noted, 'Like them slick flicks [pornographic movies], it's all about the bulge. It never even gets that far [explicitly showing other people the gun].' Another non-gang affiliated youth notes: 'Thing is, see, it ain't really about fighting or nothing, because even if you have a group of guys and you see a group of guys, lot of times, it's just you show 'em you got one, they show you they got one, and you just be on your way. It's just like signifying that you prepared.'

Even for older gang members and professional criminals who are regularly engaged in crime, gun use was typically limited to simply brandishing the weapon. For example of the 57 older gang members SV interviewed, only around 10% admitted to having fired their gun during a robbery.[9]

2.2.2. *Gun quality*

Prevailing wisdom about the demand for gun quality in the underground market is nicely summarised by Sheley and Wright (1993, p. 33): 'No military force willingly

[9] One notable exception is for robbing drug dealers. One informant described to SV his technique of firing a shotgun through the dealer's door in order to 'buy yourself some time to steal their shit because it makes so much noise ... and they need to see you mean business.'

enters battle with inferior weapons, and likewise, no central city resident would willingly carry anything other than the best small arms available.'[10] We instead find that preferences for gun quality are heterogeneous, consistent with the findings noted above that many consumers seek guns for status.

SV's younger informants tend to be quite ignorant about gun quality and general gun use. Fewer than one in ten of the 190 non-gang affiliated youths SV interviewed had ever been taught how to use a gun.[11] Older gang members and professional criminals tend to be more discerning. One older gang affiliate recounts his gun preferences for the purposes of robbing commercial establishments, especially for daytime robbery:

> 'When [cashiers] see that Glock [manufacturer of popular 9 mm semi-automatic pistols] or that .38 [caliber handgun] – I mean, a .44 [caliber] would be better, but that's hard to find around here – then you get that cash quick. You don't want to be keeping one of them sissy weapons.'

The presence of buyers who are indifferent to whether a gun works helps to explain how the market handles the problem that guns are 'experience goods'– sellers for obvious reasons discourage buyers from test-firing the gun during the transaction. The same information problem that faces buyers – working and non-working guns are often observationally equivalent – means that youth can 'produce' the ultimate services of interest (status, intimidation) with a broken gun as easily as with a working gun.

2.2.3. *Gun prices*

Interviews by SV with 116 gun-owning non-gang affiliated youths (age 18–21) reveal prices paid that range between $250 and $400. Interviews with 11 local gun brokers, who handle a large share of retail transactions on behalf of importers, suggest most of their guns are sold for between $150 and $350. These prices are typically for guns of low quality, manufactured by companies such as Lorcin, Raven and Bryco. These names were often mentioned to SV in interviews and as noted above also show up frequently in administrative data on confiscated crime guns maintained by ATF. While SV's interviews do not include information on the condition of the gun, it is noteworthy that most pistols from these manufacturers listed on websites (such as gunsamerica.com) sell for between $50 and $100 (with a $10 mailing/transaction fee), even for those used guns that are reported to be in 'excellent condition'.[12]

Thus the price markup in the underground market appears to be substantial. The street markup for illicit drugs such as heroin and cocaine appears to be somewhat higher: Jeffrey Miron estimates that '. . .the black market price of cocaine in the United States is 2–4 times the price that would obtain in a legal market, and of heroin 6–19

[10] Some criminologists, such as Kennedy *et al.* (1996), have observed that criminals may tend to acquire low quality guns in practice even though some express a desire for high-quality guns. ATF's top-ten crime-gun lists (ATF 2000*b*) have long noted the prevalence of cheap guns used in crime.

[11] For example one youth, 'Tony', narrated a common learning experience. SV: 'So, how did you know what to do with the .38?' T: 'I took it, started putting bullets in. Hell, I even put a rock in there and tried to fire it! You know, I just fiddled with it.' SV: 'Did it fire?' T: 'I'm not sure. I think it did.' SV: 'Well, that's kind of like saying "I might be pregnant." Either it fired or it didn't.' T: 'I mean it made a noise.' SV: 'Um, hmm. A noise. So, you really don't know anything about guns except possibly how to kill yourself.' T: 'Listen, it's not like we get taught that in school.'

[12] Under federal law guns can only be sent by mail to licensed dealers, so these web sites require some FFL to broker the sale.

times' (Miron, 2003, p. 529). But in still more stringent conditions, the price of handguns could increase to rival the drug markup. In a recent study of the underground gun market in England, based on interviews with 80 people imprisoned for Firearms Act violations, Hales *et al.* (2006) found that prices paid for handguns ranged 'from around £150 to £200 for a gun known to have been used in a crime, to a typical £1,000 to £1,400 for a new 9 mm model' (p. xii).

2.2.4. *Volume of transactions*

The underground market in firearms is a small part of the overall underground economy. We estimate that there are no more than 1,400 gun sales per year in the GB/WP area,[13] or about 1 sale per year for every 30 people living in this very high-crime neighbourhood. By comparison there would be at least 200,000 and perhaps as many as 500,000 or 1 million cocaine sales in this community every year – a difference of up to three orders of magnitude. Total revenue in this community for gun sales would be on the order of $200,000 to $500,000, compared to perhaps $10 or $20 million in the market for cocaine.[14] Our findings in this sense are quite consistent with those reported by Koper and Reuter (1996).

2.2.5. *Search costs*

SV's interviews provide three types of evidence for substantial search costs in the underground gun market in the GB/WP area:

- A system of local brokers has developed to facilitate market exchange and typically charge $30 to $50 per transaction, a large percentage of the sales price. These brokers capitalise on the information they have about the local underground economy – of the 11 brokers SV interviewed, all were over 30 and long-time residents of the area, and most were either participants in or closely connected to suppliers in the illegal markets for sex, gypsy cabs, or unregulated car repair or hairstyling.
- Even local gun brokers report that a large share of their transaction attempts fail – around 30–40%. Reasons included the inability to get a gun from a supplier; the customer and broker could not agree on the location for the transaction; and the broker either did not trust the customer's intentions or thought he or she was an undercover police officer.[15]

[13] SV interviewed five gun 'brokers', discussed in more detail below, who report an average number of gun transactions during the past year of 16. SV knew of 24 brokers working during the 15-month period of his fieldwork, and believes there were no more than 5 or 10 additional brokers not known to him, so we conservatively assume 34 total brokers in operation in the GB neighbourhood, who (if his group of 5 interviewees is representative) would have facilitated a total of 544 sales. Gun suppliers report that 60–80% of their sales are negotiated through brokers (we assume the 80% figure) and by our own estimates gun suppliers account for around half of all gun sales in the GB community, implying a total of around 1,360 gun sales per year. There are about 48,000 residents in the combined GB neighbourhoods.

[14] Our thanks to Peter Reuter for these drug market calculations. He notes that each year in the US there are perhaps 250 tons of pure cocaine, sold in pure units of 250 milligrams, suggesting around 1 billion sales nationwide each year. If we assume the national rate applies in the South Side GB/WP neighbourhood then there would be around 200,000 transactions, but given that this area is unusually disadvantaged there could plausibly be as many as 500,000 or even a million sales per year.

[15] In other cases, the transaction failed because the customer failed to bring enough cash to the transaction or tried to negotiate down the price.

- Interviews with 17 young adults who consider themselves 'regular' thieves, self-defined as deriving a substantial share of income from crime and engaging in at least four thefts per year, further support the general finding. Of the 17 interviewees in this group, only one person said they could find a gun in less than a week.

The search process in this market is further complicated by the fact that participants require information about prospective trading partners to engage in exchange.[16] In this market, reliable 'connections' appear to be scarce. The underground market for guns in Chicago does not involve large amounts of money but executing transactions with strangers is surely a risky business. The buyer may be an undercover police officer or potential informant, or simply dangerous. One gun dealer explained his preference for relying on brokers rather than dealing directly with customers:[17]

> 'You never know who these niggers are that need these things. Sometimes they just act crazy on you, 'cause you know, if I want a gun, then usually you pissed off. And, I don't like messing with these fools, 'cause they sometimes don't pay, they steal your shit. And, you know, they could be working for the cops, too, so I got to trust the folks I'm working with.'

Why do people tolerate these search costs when any Chicago resident can identify the location of numerous licensed suburban gun dealers with a quick search of the local phone directory or the Internet? These dealers are not prohibited from selling guns to Chicago residents. Even those people who are themselves ineligible to buy a gun from a licensed gun dealer can get someone else, usually a wife or girlfriend, to make a 'straw purchase' on their behalf if she obtained an Illinois Firearm Owners ID (FOID) card. The answer seems to be in part that the residents of SV's neighbourhoods are very parochial, perhaps because gang turf increases the risks of travelling to other areas.[18] One gang leader notes:

> 'Most of us, we never been outside these four or five blocks, our neighbourhood. Now, how can you bring the guns here if you don't even know how to get to other places? ... Even if we go to jail, we really spend most of our time around where we live, where we work.'

Table 2 presents the results of our analysis of administrative data on confiscated crime guns that were traced by the ATF. Chicago submits all confiscated crime guns for tracing during our study period, although of course only a fraction of crime guns are ever confiscated; see Cook and Braga (2001) and our data Appendix. With this caveat in mind, the first column of Table 2 shows that guns recently purchased in the Chicago suburbs of Cook County account for only around one-tenth of the crime guns in the

[16] In an analysis of drug law-enforcement strategy, Mark Moore points out that '...what is consistently difficult about drug trafficking is the process of reliably executing large financial transactions in a crooked world with no police or courts to enforce the contracts' (Moore, 1990, p. 138).'

[17] The account suggests part of the broker's fee is rent on broker information, and part is compensation for the unavoidable risks associated with selling guns.

[18] Another possible explanation is that federally licensed firearm dealers (FFLs) are by law required to record the identity of the official purchaser, which increases the legal risk associated with buying a gun from a dealer (even if one's girlfriend or wife makes a straw purchase).

Table 2

Markers for Straw Purchases for Guns Confiscated in Field Site and Rest of Chicago

	Grand Blvd/Wash Park	Rest of Chicago
Confiscated within 3 years of initial purchase	25.5%	27.6%
Confiscated within 3 years of initial purchase and first purchased in Cook County	10.6%	11.8%
Confiscated within 3 years of initial purchase and first purchased in Cook County by a female	2.1%	1.8%

GB/WP community, with only about a fifth of these guns (2% of the total) first purchased by a female.[19]

2.2.6. *Gun 'rentals'*

SV's sources reported that guns are often loaned out or shared in the GB/WP neighbourhood. However most of these exchanges occur outside of the market context and occur among people within the same social network, and so do not conform to what we would think of as a normal 'rental market'.

One form of sharing arises from the fact that groups of youths often join together to purchase a gun collectively. In particular youths who are not affiliated with a gang would be expected to have greater difficulty in making an arms-length connection than others. In SV's 116 interviews with non-gang-affiliated youths who had owned a gun, 40% reported obtaining their gun from a relative.[20] The importance of family sources for this group is consistent with previous surveys of criminally active youth; see Koper and Reuter (1996) for a review.

2.2.7. *Ammunition*

Ammunition (like guns) is illegal in Chicago,[21] and because most people rarely if ever fire their guns is essentially a durable good. Most people interviewed by SV have trouble securing ammunition and face large price markups compared to the legal market. Waits of 1 to 4 weeks for ammunition were not unusual. As one respondent noted, 'You really don't have someone who sells ammo around here, I mean it's like you have to hope you can get it from [the organisation] or maybe [a gun broker]. But you never

[19] Our finding that straw purchasing is rare in Chicago's underground gun market is consistent with results from interviews with incarcerated juveniles in Maryland, who also report rarely leaving their communities to get guns (Webster *et al.*, 2002). It is possible that increased enforcement by Chicago Police Department and ATF over the course of the 1990s made it less attractive for gun traffickers to use females as straw purchasers of new guns at nearby licensed dealers.

[20] In addition, 35% obtained their gun from someone affiliated with a gang; 17% from a licensed security guard; 6% from a broker; and 2% from some other source.

[21] Chicago law forbids the possession of ammunition except if the individual 'is the holder of a valid registration certificate for a firearm of the same gauge or caliber as the ammunition possessed, and has the registration certificate in his possession while in possession of the ammunition', or 'is a licensed weapons dealer . . . or [runs] a licensed shooting gallery or gun club'. Put differently, anyone found in illegal possession of a gun will also by definition be in illegal possession of ammunition if the gun is loaded. Secondary sales of either guns or ammunition are illegal by private parties in Chicago.

know, so, lots of times it's just a waiting thing, where you hope that someone who you got the gun from might have some bullets. But that really never happens, usually it's the gang that sells it or you just know somebody.' One non-gang affiliated youth reported that he spent $50 to get 10 bullets for a Beretta semi-automatic for which he had paid $300. By contrast, for $50 in the legal market one can purchase a box of 500 rounds of 9 millimetre ammunition. The ratio of street to legal prices in this case is on the order of 50 to 1.[22]

While older professional thieves often have more reliable sources of ammunition, even this group carefully rations bullets. One professional criminal reports to SV: 'I'm stealing a lot of car radios right now, and sometimes, if I get really brave I may try to take a purse. For that shit, I keep the gun, but I never use it, you know. I don't even load it, I keep the bullets I got for the bigger shit I do.'

3. Explaining Transaction Costs in the Underground Gun Market

Why do the high transaction costs documented in the previous Section exist and persist in the underground gun market studied by SV on the South Side of Chicago? In market environments where search for trading opportunities is costly and information is scarce, there can be a market 'thickness' effect in which transaction costs decline as the number of buyers and sellers increases. This seems like a potentially promising explanation for the high transaction costs we find in the gun market, since illegality impairs information transmission. But that leaves unanswered the question of why the gun market is so thin. We consider several explanations including policing, gangs and neighbourhood or city-specific factors, with an eye toward identifying policy levers to further reduce the efficiency of these markets (Schelling, 1984). Anti-gun policing and low overall rates of household gun ownership seem to be among the more important contributors to limiting the number of willing suppliers.

3.1. *Theory*

The illegality of the gun market in Chicago creates information problems in matching prospective buyers and sellers. Neither side of the market can take advantage of the well-developed infrastructure for legal advertising. In addition the illegality of the market means that participants do not have recourse to the courts to enforce transactions. The risk of theft, arrest, injury or even death associated with exchange means that buyers and sellers will want to obtain additional information about the characteristics of their trading partners. Matches of buyers to sellers will differ in quality depending on the degree to which one knows one's trading partner, or knows those who know one's trading partner. Given the information requirements and scarcity associated with exchange in the underground gun market, economic models that

[22] http://www.ammunitionstore.com/pricelist_ammo4.htm#9mm. In their interview study of prisoners for the Home Office, Hales *et al.* (2006) also find high prices for ammunition, and conclude that 'Ammunition appears to be a limiting factor and harder to obtain than firearms (p. xiii).' Interestingly their informants report that guns are usually sold bundled together with a small amount of ammunition, which is not true in Chicago.

emphasise search costs are a natural starting point for understanding the source of the transaction costs that we document in the previous Section.

The stochastic matching model developed by Diamond (1982) provides one way to understand transaction costs in the gun market. The prohibition on gun sales in Chicago introduces trade frictions, and moves us away from what Diamond describes as the 'fictional Walrasian auctioneer' that is usually assumed to facilitate exchange. Illegality makes it difficult to advertise, and so trade requires some search effort by both buyers and sellers with some probability of failure that is inversely related to overall market activity. In this type of environment economic activities can create trading externalities and positive feedback effects: 'The externality comes from the plausible assumption that an increase in the number of potential trading partners makes trade easier. The positive feedback is that easier trade, in turn, makes production more profitable' (Diamond, 1982, p. 882). That is, there will be a market 'thickness' effect where search costs decline with an increase in the number of market participants.

Similarly, Gan and Li (2004) and Gan and Zhang (2005) develop models with heterogeneity in products and buyer preferences, where search costs lead to a market thickness effect on match quality. Since match quality is relevant to our definition of transaction costs – product uncertainty and risk of injury or arrest should be lower when buying or selling a gun to someone about whom more is known – this type of model provides another complementary explanation for why there would be a market thickness effect on transaction costs in the gun market. An increase in the number of market participants increases the odds of encountering a buyer or seller that one knows or is at least known within one's social network.

Note this literature suggests it is in large part the *combination* of illegality and 'market thinness' that drives the transaction costs we document in the underground gun market. In 'thin' but legal markets, trading institutions can develop to reduce the costs to buyers and sellers of finding trading partners. For example, eBay has special Sections of its website devoted to the markets for antique dolls (pre-1930), Annette Funicello bears, imitation pearl pins and brooches, and game-used Major League Baseball memorabilia.[23]

If the market were illegal but thick, as for narcotics, institutions would develop to facilitate exchange, and sellers and buyers would have incentives to develop reputations (Koper and Reuter, 1996; Venkatesh, 2006).[24]

The limited evidence available on price mark-ups for other illegal, thin markets is suggestive of large markups. For example, one estimate from the Centers for Disease Control in the United States found that the Supreme Court's *Roe V. Wade* decision legalising abortion may have reduced the average price of an abortion from $500 to $150, while other estimates suggest prices may have declined by as much as 90% in

[23] See http://www.ebay.com

[24] For example drug-selling corners have developed in that market and seem to change locations easily in response to law-enforcement pressures, given that buyers and sellers are closely connected and so information about changes in trading locations is easily transmitted back and forth. In contrast in the underground gun market some white ethnic street gangs or gun importers help to organise fist-fighting events in the city's warehouses but these occur only every 3–4 months. The coordination costs of moving these fighting events in response to legal or other threats is greater than with relocating a drug corner and so these events are advertised only among a selected clientele.

some jurisdictions. There is also evidence that the market for illegal abortions prior to *Roe* was characterised by substantial price dispersion and often considerable physical risk (Graber, 1996, pp. 60–7). Similarly, pharmaceuticals to induce abortion that are sold for 50,000 rials in Pakistan or India are reported to have a retail street price in Tehran on the order of 200,000 to 700,000 rials.[25] The Center for Strategic and International Studies (1996, p. 115) reports that in the 1990s, Iraqi agents offered to buy a nuclear warhead from the director of a Russian nuclear research centre for $2 billion. By comparison the average cost of producing a nuclear warhead for the US is probably no more than $80 million.[26]

3.2. *Sources of Market 'Thinness'*

Why is the gun market so 'thin'? The descriptive results presented in Section 2 suggest that the durability of guns (and ammunition) may play some role, as does the possibility of shared ownership of guns by groups of youths. But this cannot be a complete explanation, particularly on the supply side.[27] After all, drug dealers regularly come into contact with many of the people who would at least periodically want a gun; why do they not diversify into the gun trade as well? In what follows we consider four general types of explanations: police pressure; interference by gangs; neighbourhood-specific factors; and city-specific factors.

3.2.1. *Police*

A drive through Chicago's South Side highlights the limits on policing the underground markets for drugs and sex services; street corners populated by drug dealers or prostitutes are a common sight, even in the middle of the day. And yet we find that the police activity does discourage participation in the gun trade. Police pressure against guns has the effect of jeopardising gang profits from the more lucrative drug trade, if the gang is careless about its involvement with guns.

While historically gangs were often organised for defensive or social purposes (Klein, 1995; Akerlof and Kranton, 2000), over time some gangs have undergone a process of 'corporatisation' (Levitt and Venkatesh, 2000). The most important income-generating activity of the gangs studied by SV on the South Side of Chicago is the distribution of illegal drugs (Levitt and Venkatesh, 2000).

As one gang leader explained to SV about why his organisation does not sell guns: 'It's really not worth it because not that many people buying.' Another gang leader notes: 'Police don't like [guns] moving around here, man. We stay away from that shit,

[25] http://www.parstimes.com/women/abortion_tehran.html

[26] Stephen Schwartz of the Brookings Institution estimates that from 1940 to 1996 the US spent about $5.5 trillion in constant 1996 dollars on nuclear weapons and weapons-related programmes (http://www.brookings.edu/fp/projects/nucwcost/schwartz.htm). Between 1945 and 1990 a total of 70,000 different warheads were produced (http://www.brook.edu/fp/projects/nucwcost/50.htm). Dividing the total expenditures 1940–96 by the total production 1945–90 yields around $79 million per warhead in 1996 dollars. To the extent there was additional production from 1990–6, the cost per nuclear warhead to the US government would be even lower than this crude estimate would suggest.

[27] On the demand side, many owners loan their guns out and never get them back, lose them, or sell them when cash is tight (Cook and Ludwig, 1996). In addition many youth in SV's neighbourhoods seem to have trouble finding suitable places to store their guns, which further increases the probability of theft or loss (Cook *et al.*, 2005).

see, 'cause we already got enough trouble with them [police].'[28] Police typically assume that gang members or alumni caught in possession of a gun obtained the weapon from the gang and so crack down on the gang accordingly.[29] These remarks are consistent with what one police officer explained to SV:

> 'Look, I'll be honest with you. There will always be drugs, drug dealing and drug dealers. The reason we get tight on guns is that it's better that there be drugs and no one gets killed than if someone gets killed. We love guns! We love getting them because it makes the job easier on the street. So, when we find one, yes, we really go after them [gang leaders] because they know the rules. They know the agreement, and if we get a gun, that means they broke it.'

3.2.2. *Gangs*

An alternative possible explanation for the 'thinness' of the underground gun market studied by SV is that gangs actually suppress the gun trade in order to preserve a monopoly over the capacity to inflict lethal violence in the neighbourhood. Yet SV's interviews do not find that gangs expend a great deal of effort in suppressing gun markets. Gang leaders are interested in knowing who is selling guns on their turf, and charge the standard 'tax' applied to other forms of underground exchange but do not seem to take any unusual actions to reduce the number of sellers in the gun market.

In fact, SV's interviews suggest that a substantial amount of gang involvement by neighbourhood youth is itself motivated by the transaction costs that seem to exist for other reasons in the underground gun market. For members, a gang creates a social network within which gun transactions can be accomplished with relatively little risk. The gang leadership has information about the reliability of its members and can make a credible threat to punish misbehaviour. Many respondents to SV's interviews on the South Side of Chicago report that they joined or stay in the gang to preserve access to guns. As one former gang member notes, 'You never leave [the gang] before you got the gun, because after you leave, they don't really have no reason to help you get one.'

In practice access to guns within the gang is regulated, with most transactions in the form of loans or rentals with strings attached. The general rule is that members can only own guns if authorised by gang leaders. These gang leaders in turn ration gun ownership in part by age. 'Shorties', young rank-and-file members who often want guns for social status, are typically authorised to access guns during gang wars (though even then many shorties are only allowed to carry knives), drug sales (at least for one member of the 4–6 member drug selling team assigned to provide security), and drug pick-ups and drop-offs outside the gang's own turf. These constraints are motivated by

[28] Another gang leader expressed his frustration about gun use by gang alumni: 'It's like these niggers get stupid after they leave. I mean, they know not to keep a gun on them when they do this [engage in income-generating crime], 'cause the cops hate that shit. I mean, they could use a knife or something. Why the gun? That just brings down [the police] on us really, I mean, that's the thing that happens all the time, [the gang] gets blamed and we get shut down.'

[29] During SV's fieldwork on the GB/WP neighbourhood, 43 gang members exited out of the 2 largest street gangs in the area, of which 37 continued to work in some capacity in the local underground economy (such as selling drugs, committing burglaries, fencing, or providing off-the-books services as day labourers or security guards). Of this group, 11 were arrested and in every case a gun was confiscated. In 7 of these cases, the police confronted the gang leaders about whether they had provided the suspect his gun.

the gang's other economic interests, including the fact that gun violence induces police crack downs on gang drug-selling activities and also may scare away customers.

Sometimes gang leaders actually enlist the police as agents in controlling gun use by notifying the police about unauthorised gun possession by rank-and-file shorties. In this scenario the police usually confiscate the gun but do not make an arrest, which helps to reduce enforcement costs to both gangs and the police. As one police officer notes:

> 'Yes, I suppose I'll admit that, on occasion, we will act on a call from [the gang leaders]. We prefer to have the guns off of the street. That is our first priority. It's hard, we cannot stop guns from coming through here, but these kind of arrangements help us to control who gets hurt. That's not good policing some would say, but they are not seeing what I see every day.'

Older gang members are less likely to use guns in ways that are contrary to the gang's economic interests both because age may reduce impulsivity and because many older members stay in the gang primarily for economic reasons.[30]

3.2.3. *Neighbourhood-specific factors*

A third possible explanation for SV's findings of high transaction costs in the gun market attributes them to factors that are unique to the neighbourhoods he studied. The neighbourhoods studied by SV are located somewhat far away from suburban gun dealers, are notorious for having among the city's most powerful street gangs, and could plausibly be subject to unusually vigorous policing against guns.

Yet we find that neighbourhood-specific factors cannot be a very important explanation for the transactions costs documented by SV given that prices, availability and other characteristics of the gun market in the GB/WP area as measured by administrative and other survey data appear to be so similar to the rest of Chicago. Compare for example the first and second columns in Table 2 on the proportion of confiscated crime guns traced by ATF that show the hallmarks of having been 'straw purchased' in suburban gun stores. Appendix Tables A1 to A4 show crime guns found in SV's study area are similar to those from the rest of Chicago along other dimensions as well. The similarity between these administrative data and SV's interviews of course also enhances our confidence in the reliability of the latter.

Table 3's statistics suggest SV's findings are also consistent with the reports of 1,194 arrestees interviewed in Chicago in 1996–7 as part of the US Department of Justice's Drug Use Forecasting (DUF) system (see data Appendix). For example, the prices paid are in the same range: of the 20% of DUF arrestees who ever owned a gun, more than two-thirds report having paid between $100 and $499 for their most recent gun, with a median price of $150 (median price of $100 for adult males, as seen in column two). DUF respondents also report high transaction costs. Of those arrestees who never owned a gun but indicated they might want one someday (just under one-quarter of

[30] Gang leaders also value the human capital developed by experienced members and so are more likely to formally or informally waive the gang's rules on gun ownership for older members. As one gang official notes, 'The way we do it is that we just don't write down that [the older guys] are carrying something.' Gang leaders sometimes use access to guns as an incentive for performance; for example, in some gangs the custom is to provide a gun to members who successfully execute authorised drive-by shootings.

Table 3

Gun Acquisition and Gang Membership among Chicago Arrestees

	Full sample	Adult males only
Sample size (*N*)	1,194	1,074
Ever own handgun?		
Yes	20.8%	20.4%
Gun acquisitions (for those ever owned)	%	%
Stole	6.1	6.9
Rented/borrowed	10.4	10.3
Bought	61.9	59.6
Gift/other	21.6	23.2
Total	100.0	100.0
Amount paid if bought:	%	%
$ 0–50	5.7	6.8
$ 50–99	20.5	24.7
$100–199	34.1	34.2
$200–499	33.0	26.0
$500 or more	6.8	8.2
Total	100.0	100.0
(Median paid)	($150)	($100)
Might want gun? (of those never owning)		
	17.6%	17.4%
How long to get gun? (those who want one)		
More than a week	61.4%	60.4%
Gang member?		
Current	21.1%	19.8%
Current or Past	44.3%	43.6%

Source. Author calculations from Drug Use Forecasting System data for 1996 and 1997 (ICPSR 9477).

those who never had a gun), fully 61% indicated that it would take them more than one week to get a gun.

The DUF survey reports in Chicago also confirm SV's field data about the limited involvement of drug dealers with gun sales. Only 40% of the arrestees interviewed in Chicago as part of the DUF system agree with the statement that 'if you want a gun, drug dealers will be able to get one for you'. Finally, DUF responses suggest that gang membership is quite common in Chicago as a whole, not just in the GB/WP neighbourhood studied by SV. Fully one-fifth of Chicago arrestees interviewed in DUF report being gang members at the time, while a total of 44% had ever been in a gang.

3.2.4. *City-specific factors*

The final type of explanation we consider for the thinness of the gun market studied by SV are city-specific factors. It appears that guns are somewhat more difficult for criminals to get in Chicago than other cities, although guns are surprisingly difficult for criminals to get in other cities as well. To the extent to which Chicago's gun market works less well than in other places, the most likely explanations are the city's low rate of household gun ownership and police emphasis on guns, rather than the city's ban on private possession of handguns.

Detailed ethnographic information is not available for cities other than Chicago. However the 1996–7 interviews of arrestees in 22 cities conducted by the Drug Use Forecasting (DUF) project included an addendum about gun ownership and use.

Making reliable inferences from the DUF data is made difficult by the fact that the study uses unrepresentative ('convenience') samples of arrestees in participating cities. In several cities, sample characteristics appear far out of line with what we learn from other sources. Nevertheless the DUF data provide one of the best (albeit imperfect) ways to compare gun markets across cities.

The top panel of Figure 1 shows that the fraction of arrestees interviewed in the Chicago DUF site who report that they ever owned a gun, 21% (measured along the vertical axis), is much lower than the mean and median values for DUF cities (31% and 33%, respectively). The Figure also highlights obvious measurement error – specifically, the rates of gun ownership reported by arrestees in two of the Texas cities in the sample, Dallas and San Antonio, are implausibly low. For that reason we should be cautious drawing strong inferences from the pattern of findings across individual DUF sites. But the overall finding that a minority of arrestees had ever owned a gun, and a still smaller percentage currently owned one, is plausible, since it is in line with the prevalence of gun use in crime. (We discuss this matter in greater detail below.)

Several other measures available from these DUF arrestee interviews also suggest that guns may be difficult for a high proportion of criminals to access across cities. Of the 18% of Chicago arrestees who had never owned a gun but thought they might want one someday, about 70% report that it would take them at least a week (which includes those who say they think they would be unable to get a gun at all), while only around 15% say they could get a gun within a day. In the other DUF sites about 60% of arrestees who had never owned a gun but might want one think getting a gun would require at least a week, while only around 20% think they could get a gun in a day

The potential importance of gun prevalence to transactions costs is illustrated in Figure 1. The top panel depicts a positive relationship between DUF reports of gun ownership by interviewed arrestees and the best available county-level proxy for household gun ownership, the fraction of suicides that involve firearms (FSS), with a slope for this regression relationship equal to +0.310 (SE = 0.16, p = 0.06).[31]

The bottom panel of Figure 1 shows the same basic pattern when we adjust for arrestee and offence characteristics for DUF respondents to account for differences across cities in the survey samples. We first regress the individual DUF responses about lifetime gun ownership against a detailed set of arrestee and offence characteristics.[32] We then replace our measure for actual DUF gun ownership on the vertical access with the DUF site means for the regression residuals, and continue to find a positive relationship between this measure and FSS (slope = +0.36, se = 0.15, p = 0.03).

To what extent does gun policy contribute to scarcity of guns to criminals? One intriguing pattern in Figure 1 is that the three DUF cities with the most stringent

[31] The US does not maintain administrative data on gun ownership and most surveys are not representative at the local level. The fraction of suicides committed with guns has been shown to be highly correlated with survey-based estimates of household gun ownership at the state or region level in both the cross section and within jurisdictions over time (Azrael *et al.*, 2004; Cook and Ludwig, 2006*a*).

[32] These characteristics include interactions between gender and race/ethnicity, age (using separate indicators for two-year age categories from 15 to 30, then 5 year age groups to age 60, with a catch-all category of 60 and over), indicators for whether the arrestee self-reports having used drugs in the past year, an indicator for self-reported sold drugs in past year, whether the respondent tested positive for various drugs in the urinalyses tests administered to arrestees as part of the DUF, and whether the respondent self-reports having ever used marijuana, cocaine or heroin. We also condition on a rich set of indicator variables for the specific criminal charge for which the arrestee was arrested.

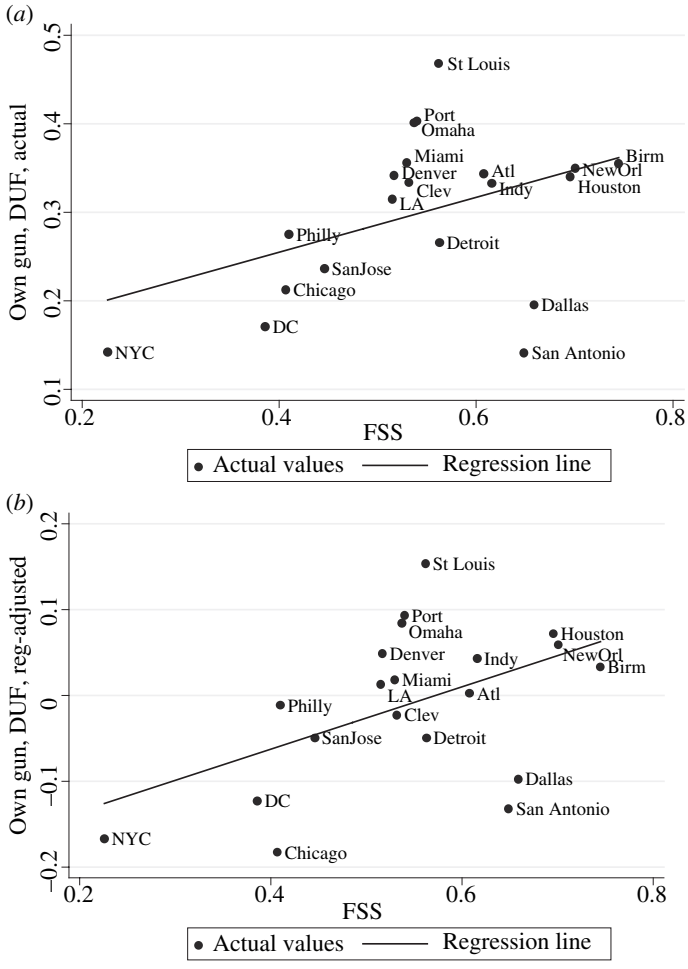

Fig. 1. *Lifetime Gun Ownership Rates Among Arrestees Interviewed in 22 Cities by DUF vs. Household Gun Ownership Rate Proxy* (fraction suicides with gun, FSS)
Notes. (a) Actual lifetime gun ownership reports by DUF arrestees. (b) Lifetime gun ownership reports by DUF arrestees, regression-adjusting for offender and offence characteristics.

restrictions on private handgun ownership (Chicago, New York City and Washington, DC) are all clustered together with low rates of household gun ownership and low rates of lifetime gun ownership reported by arrestees in the DUF study.

Figure 2 shows that Cook County, which is dominated by Chicago, experienced a temporary dip in our proxy for household gun ownership rates, FSS, following the city's handgun ban in 1982. (We present 5-year averages for FSS to reduce measurement error.) However a simple difference-in-difference estimate suggests this is not due to the ban, since from 1979–82 to 1983–7 the dip in FSS in Cook County (−4.3 percentage points) is actually smaller than in surrounding counties unaffected by the ordinance (−8.8 percentage points) or in the rest of Illinois (−6.0 points). Nor did household gun ownership rates decline in the District of Columbia following that city's handgun

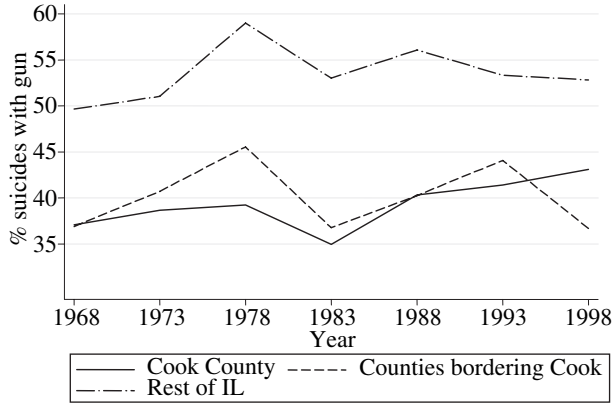

Fig. 2. *Trends in % Suicides with Guns (Proxy for Gun Ownership) for Cook County, Neighbouring Counties and the Rest of Illinois*

ban in 1978, either absolutely or compared to the nearby city of Baltimore over this period (Cook and Ludwig, 2006*b*, p. 710). The fact that Chicago and DC have low gun ownership rates may be more cause than consequence of restrictive local gun laws.

We should note that it is possible that handgun bans affect gun availability to criminals in ways other than by reducing household gun ownership rates, as might occur if owners are now less likely to resell their guns through unregulated secondary market transactions. Our FSS measure would not be informative about these types of effects, and more direct measures of gun access to criminals (such as those in the DUF) are not available for multiple points in time. Chicago's handgun ban may also have helped to reduce criminal access to guns by preventing the location of licensed gun dealers in high-crime neighbourhoods.

SV's interviews also point to another important policy – the Chicago Police Departments' (CPD) long-standing emphasis on taking guns off the street. Starting in the 1950s the CPD has emphasised a policy of 'making your presence felt', which involves getting patrolmen out into the community to interact with the public, make vehicle or other stops and search for guns as appropriate. At least during the 1950s and 1960s officers who confiscated illegal guns were provided with departmental citations.[33] During the period 1999–2003, the Chicago Police Department averaged over 10,000 firearms confiscations per year, far in excess of other large cities.[34]

Pushing in the other direction is the prevalence of gang membership. Table 4 shows that Chicago together with Los Angeles are outliers in the DUF sample with respect to gang activity, with around 20% of arrestees in these cities reporting membership in a gang at the time of their arrest, about eight times the median value in the DUF sample and about twice as high as the rate reported in the next-highest city, Birmingham. Chicago and LA continue to have unusually high rates of gang membership if we limit

[33] Personal communication of Philip Cook with Herman Goldstein, August 18, 2004.

[34] Chicago Police Department, *Annual Report: 2003 Year in Review*. By comparison, from 1999 to 2001 a total of around 12,000 guns of all types were confiscated each year in New York State as a whole (Council of the City of New York, Office of Communications, September 12, 2003, 'Committee Hears Testimony on Proposals to Stem the Flow of Illegal Guns Into the City').

Table 4

Gang Membership Among Arrestees in DUF Sample

City	Full sample			Adult Males		
	Sample (*N*)	Currently in gang	Currently or ever in gang	Sample (*N*)	Currently in gang	Currently or ever in gang
Chicago	2,216	20.5	44.9	2,077	20.3	44.2
Los Angeles	3,076	18.9	33.6	1,161	12.3	27.1
Birmingham	3,630	10.8	20.3	1,816	4.9	14.6
Denver	5,589	8.4	22.8	2,336	3.6	17.9
Phoenix	1,555	7.8	19.5	677	5.3	16.5
St. Louis	2,331	6.3	23.3	1,352	5.0	25.2
Indianapolis	4,313	5.4	18.3	1,836	5.3	21.5
Portland	495	5.3	13.5	239	1.3	10.0
San Antonio	4,040	5.1	17.1	2,127	3.0	14.2
San Jose	1,370	5.1	16.6	721	2.2	12.2
Cleveland	2,733	3.2	17.5	1,258	1.4	15.4
Omaha	2,750	2.8	13.8	1,936	3.5	16.2
Houston	2,360	2.5	12.3	1,505	3.3	14.6
Miami	1,360	2.1	9.8	1,299	2.0	9.5
Dallas	3,274	1.9	11.2	2,056	2.5	12.9
Fort Lauderdale	2,783	1.5	10.2	1,816	1.9	12.9
New York	2,189	1.1	11.1	1,456	1.2	14.1
Detroit	2,238	1.0	8.0	1,549	0.9	9.3
Philadelphia	2,371	0.8	10.9	1,452	1.3	14.7
New Orleans	2,838	0.7	6.4	1,887	1.1	7.3
Atlanta	7,285	0.7	6.5	5,511	0.7	7.3
Washington, DC	2,735	0.4	4.2	1,538	0.4	5.1
Median						

Source. DUF samples of arrestees, 1996 and 1997. (See Appendix for details.)

the sample to just adult males (last three columns of Table 4) or regression-adjust for a more elaborate set of arrestee and offence characteristics (not shown).

Consistent with SV's interview reports, among DUF arrestees in Chicago we find that the proportion who report ever having owned a gun is much higher for those in gangs compared to other respondents (30% vs. 19%). The same differential between gang and non-gang members is found in other DUF cities, although the absolute levels of gun ownership are much higher for both groups (58% and 29%).

4. Gun Availability and Gun Use in Crime

The previous Sections of the article present evidence of substantial transactions costs in the underground gun market in Chicago's South Side, in the rest of the city as well, and to some extent in other cities across the US. The key question for social welfare is whether the difficulty a criminal has in obtaining a gun affects what really matters for social welfare – gun use in crime. This question is not settled by evidence that only a fraction of all arrestees interviewed as part of the DUF have ever owned a gun, since it remains possible that the most serious criminals can get guns even though most have not. The results presented in this Section suggest that transactions costs in the underground gun market do have some impact on gun use in crime.

One indirect piece of evidence that gun market frictions affect gun use in crime is that gun use in violent crime is not the norm in the US, despite its deserved reputation for outstripping other Western nations in this regard. Cook (1976) finds that the value of items taken in completed robberies is over twice as high in gun robberies as for robberies with other weapons. Yet in a country with 200–250 million guns in private circulation, guns are used in only around 27% of personal robberies and 8% of serious assaults (Perkins, 2003, p. 2).[35] Gun use is far higher than in Britain, for example, but lower than what we would expect in a truly gun-saturated society.

Table 5 demonstrates that the patterns of gun involvement in crime across jurisdictions within the US is also consistent with the hypothesis that guns are used less often in crime in gun markets where the prevalence of guns is low (contributing to 'thinness' in the underground market). In particular we consider the relationship between the fraction of suicides involving firearms (FSS) and gun involvement in crime using data for the 200 counties with the largest populations in the US in 2000. We measure gun involvement in crime using data on the share of homicides and robberies with guns as reported in the UCR.[36] It should be noted that that UCR data are known to have considerable measurement error at the county level (Maltz, 1999). The data that describe gun involvement in these UCR crimes appear to be even noisier.

The first column of the Table shows the cross-sectional relationship between household gun ownership rates and gun involvement in crime: A one percentage point increase in FSS increases the share of homicides (top panel) and robberies (bottom panel) that involve guns by about one-third of a percentage point. We estimate this model pooling three years of data to reduce measurement error in our FSS proxy for household gun ownership rates (Cook and Ludwig, 2006*a*); given that FSS evolves slowly over time within areas, almost all of the variation will be cross-sectional. We focus on the years 1994–6 because these are the last years for which data on gun involvement in robbery are available for Cook County, Illinois, which contains the city of Chicago.

We initially try to account for possible confounding factors by conditioning on the percentage of the county that is urban and African-American (both powerful predictors of crime), the county's population (in thousands) and population squared to account for the well-documented relationship between crime *rates* and overall city size; see for example Blumstein (2000). To account further for unmeasured criminogenic factors we also condition on the county's burglary rate. The second column of Table 5 reveals that our analysis is not very sensitive to excluding these covariates. The third column of Table 5 shows our cross-section results are also not sensitive to whether we weight by county population or not in the analysis.[37]

[35] That guns are used in a small minority of violent crimes might be due in part to the deterrent effect of sentencing add-ons for gun use in violent crime, rather than the difficulty of accessing guns. Previous research yields mixed results on the deterrent effect of sentencing enhancements for gun use (McDowall *et al.* 1992; Marvell and Moody, 1995; Raphael and Ludwig, 2003).

[36] We do not consider the fraction of aggravated assaults that involve guns because this offence is more susceptible to differences across areas and over time in definitional problems about the distinction between aggravated and simple assault.

[37] We also find that all of the estimates shown in Table 5 are usually qualitatively similar when we focus on just the 100 or 50 largest counties in the US, although the estimates particularly for gun involvement in robbery are usually much less precisely estimated when we employ less data. We cannot focus on all counties in the US because the Vital Statistics system only makes county-level data on suicide mortality available for the larger counties.

Table 5

Relationship Between Household Gun Ownership Rates (Correlate of Market Frictions) with Gun Use in Crime in 200 Largest US Counties

% homicides with guns	'Cross-section' model (1)	'Cross-section' model (2)	'Cross-section' model (3)	Panel model (4)	Panel model (5)	Panel model (6)	Panel model (7)
Coefficient for HH gun ownership (FSS)	0.354** (0.041)	0.323** (0.042)	0.320** (0.050)	0.157** (0.036)	0.165** (0.036)	0.128** (0.041)	0.083** (0.036)
Covariates?	Y		Y	Y		Y	Y
Weight by population?	Y	Y		Y	Y		Y
County and year fixed effects?				Y	Y	Y	Y
County-specific linear trend?							Y
Sample years	94–96	94–96	94–96	79–99	79–99	79–99	79–99
N	557	572	557	3,924	3,987	3,924	3,924
R-squared	0.365	0.095	0.223	0.557	0.552	0.430	0.615
% robbery with guns							
Coefficient for HH gun ownership (FSS)	0.316** (0.028)	0.369** (0.033)	0.257** (0.029)	0.036 (0.028)	0.066** (0.031)	0.041** (0.019)	0.010 (0.017)
Covariates?	Y		Y	Y		Y	Y
Weight by population?	Y	Y		Y	Y		Y
County and year fixed effects?				Y	Y	Y	Y
County-specific linear trend?							Y
Sample years	94–96	94–96	94–96	79–99	79–99	79–99	79–99
N	538	541	538	3,620	3,634	3,620	3,620
R-squared	0.561	0.187	0.528	0.630	0.614	0.675	0.711

Notes. Parentheses contain robust standard errors that are adjusted to account for within-county correlation in error terms. ** = Statistically significant at 5% level. The analytic sample consists of data for the 200 largest counties in the US for the period 1979–99, where gun involvement in homicide and robbery is measured using data from the FBI's Uniform Crime Reporting system and our proxy for household gun ownership is measured using the fraction of suicides involving firearms collected from the Vital Statistics system. Our 'cross-section' estimator pools together data from three years to reduce measurement error in FSS (Cook and Ludwig, 2006*a*); we focus on 1994–6 for the cross-section because these are the last years for which data on gun involvement in robbery are available for Cook County, Illinois, the county that contains the city of Chicago. Covariates included in the regression models include percentage of county black, the county's burglary rate from the UCR, county population (in thousands) and population squared, and (in the cross-section models) percentage of the county living in an urban area in the 2000 census.

The last four columns of Table 5 show that the positive relationship between FSS and gun involvement in violent crime persists when we switch from cross-section to panel regression analysis. However, the magnitudes of the coefficient estimates are smaller. The fourth column shows that a 1 percentage point increase in FSS within a county leads to an increase in the share of homicides that involve guns equal to 0.16 percentage points (significant at the usual 5% cutoff), with an effect for gun involvement in robbery that is equal to 0.04 percentage points ($p = 0.2$).[38]

Of course without a clear source of exogenous identifying variation in household gun ownership rates, these estimates do not necessarily provide reliable estimates of the causal effects of household gun prevalence on gun use in crime. Much of the variation in household gun ownership across counties over time in the US over this period derives from a general convergence in gun prevalence between the traditionally high-gun regions in the South and West with the region where guns have traditionally been less common, the Northeast (Cook and Ludwig, 2006*a*). It is thus interesting that when we also condition on county-specific linear trends (last column of Table 5) the positive relationship between FSS and gun involvement in crime remains, at least for homicide. Furthermore, in a simple 20-year difference-in-difference test that captures the long-term convergence in gun prevalence between the historically high and low-gun areas, we again obtain a qualitatively similar estimate. All told, these results presented in Table 5 provide at least suggestive evidence that one likely source of transactions costs in the underground gun market – low household gun ownership rates – is related to gun use in crime.

Finally, it is interesting to consider how gun use in crime in Chicago compares to other places. Once we control for the basic set of county characteristics described above (race and urbanicity, population and the burglary rate) the proportions of homicides and robberies that involve guns were about 6 percentage points lower in 1994–6 in Cook County (dominated by Chicago) compared to the other 200 largest counties in the country.[39]

5. Discussion

Our findings about the presence of substantial transaction costs and price mark-ups in Chicago's underground gun market stand in contrast to conventional wisdom in the sociology and criminology literatures, which in the context of the US has emphasised the ease with which criminals can access guns in the informal market, as well as the inelasticity of demand by criminals. For example, Sheley and Wright (1998) stress the

[38] Bertrand *et al.* (2004) discuss the problems of incorrectly accounting for serial correlation in difference-in-differences analysis, many of which are relevant for our estimates since our key explanatory variable of interest (FSS) is also highly serially correlated. We present robust standard errors that allow for an arbitrary correlation in error terms over time within each county.

[39] This finding is quite similar when we do not control for the burglary rate. The difference is closer to 5 percentage points if we compare Cook County to just the 50 or 100 largest counties in the US The raw (unadjusted) differences in fraction homicide and robbery that involve guns for Cook County versus the 200 largest counties equal around +8 percentage points, although the regression-adjusted comparison seems like a more meaningful indicator, at least in part because of the documented relationship between city size and both the gun homicide rate and share of homicides that involve guns (Blumstein, 2000, pp. 37–8).

ease of access on the basis of a survey of 16–18-year-old high school students drawn from a convenience sample of 53 schools. Half reported that obtaining a gun would be 'little' or 'no' trouble if they desired one, while the other half of the sample indicated that getting a gun would be 'a lot of trouble' or 'impossible'. The vagueness of these adjectives (how would a youth who thought they could get a gun in a month respond?) leaves the authors free to impose their own spin. See also, for example, Jacobs (2002); Sheley and Wright (1995, pp. 148ff.); Wright and Rossi (1994, Chap. 12.). We believe that the difference is more a matter of interpretation and emphasis than outright contradiction. But there may remain some question whether our data are misleading.

Our study relies in large part on the unusually detailed interviews and field observations of Sudhir Venkatesh, who sought to capture information about prices, waiting times and other specific characteristics of market operation, rather than potentially ambiguous descriptions of people's perceptions of how markets work. Of course SV's fieldwork, like any survey work in this area, necessarily relies heavily on self-reports from people who regularly engage in criminal or anti-social activities, which in turn raises concerns about misreporting. However SV's interviews are quite consistent with the variety of other data sources that are available to us, including those that do not rely on self-reports by criminals.

So why does the gun market in the Chicago South Side neighbourhood studied by SV have such high transaction costs? We have argued for an explanation in terms of illegality and market thinness. Handguns have been illegal in Chicago since 1982, and more generally under the 1968 Gun Control Act youths and convicted criminals cannot possess firearms or obtain them directly from licensed gun dealers. Since gun transactions are illegal in Chicago, communication between potential buyers and sellers is made difficult, especially in a thin market.

But why is the underground gun market so thin? Even if there are relatively few buyers in this market, owing in part to the durability of guns, why do drug dealers and drug-selling gangs not diversify into the gun trade given that they already come into regular contact with most of the people who would be interested in having a gun and could presumably enter into the gun selling business at low marginal cost? We argue that police emphasis on guns is an important contributing factor, since gangs are reluctant to jeopardise the profits associated with the more lucrative drug trade. Gang leaders control a stash of guns and regulate their distribution and use by members with an eye to the gang's corporate objectives. Some youths report joining a gang to gain access to guns but that access is limited.

The underground gun market in the high-crime South Side Chicago neighbourhood studied by SV is not unique. Other data sources indicate that high transaction costs characterise the underground gun market elsewhere in Chicago and in some other large cities. These cross-city comparisons in transaction costs are limited by the fact that the arrestee samples are not representative of all criminals or even all arrestees in the participating cities; better data on criminal reports about underground gun markets across cities should be a priority for future research. Cross-national comparisons of underground markets would also be of great interest for tracing out the effects of gun prevalence and regulations on transactions prices and costs.

One policy implication of our findings is that law enforcement efforts targeted at reducing gun availability at the street level seem promising.[40] If 'thinness begets thinness' in markets with non-trivial search costs, as suggested by Diamond (1982), then the impact of stepped-up enforcement activities may produce multiplier effects. Of course this virtuous cycle becomes vicious if reversed, which is of some concern given recent cuts in federal funding for law enforcement in general and for gun-oriented activities in particular (Donohue, 2004; Lichtblau, 2004). Our results also provide some support for police strategies that hold the gang as a whole accountable for gun possession or misuse by individual members, thus creating an incentive for gang leaders to regulate gun access among members. This collective-deterrence strategy seeks to leverage gang cohesion together with the economic motivations of gang leaders and was a key feature of Boston's Operation Ceasefire (Braga *et al.*, 2001; Piehl *et al.*, 2003).

While the public safety gains from local restrictions on gun ownership may be modest, broad efforts that could reduce the rate at which households own guns have promise. In principle widespread household gun ownership can have positive as well as negative externalities, by generating a general deterrent threat to criminal predation (Lott, 2000). However in practice weapon choice by violent criminals is positively correlated with prevalence of gun ownership. The best evidence indicates that an increase in gun prevalence results in more homicides, burglaries and perhaps suicides as well (Duggan, 2001, 2003; Cook and Ludwig, 2003, 2006*a*). The dollar value of the negative externality may be considerable – in one estimate, $600 per year per gun-owning household (Cook and Ludwig, 2006*a*). Increased sales taxes on guns and ammunition, or even licensing systems with annual permit fees for gun ownership, may further contribute to market thinness and increase transaction costs to criminals.

Data Appendix

Our analysis of Chicago's underground gun market draws on data from 6 main sources: intensive field interviews and observations conducted in high-crime neighbourhoods on the city's South Side by one member of our team (Sudhir Venkatesh), discussed in the text; data on crime gun traces from Chicago collected by the Bureau of Alcohol, Tobacco and Firearms (ATF); a census of all arrests made in the state of Illinois from 1990 to 2001 recorded by the Illinois State Police (ISP); city- and state-level data on crime rates and gun ownership from the FBI's Uniform Crime Report (UCR) system; the census of all death certificates in the US maintained as part of the Vital Statistics (VS) system; and data from the Drug Use Forecasting (DUF) system of arrestee interviews, specifically data from the 1996–7 gun addendum to DUF. In what follows we discuss each of the last 5 sources in turn.

[40] The possibility of buy-and-bust or sell-and-bust operations by undercover police officers could further erode trust in the underground gun market and increase the information requirements for successful exchange. Similarly, offering rewards for information about gun sellers and possessors, either in the form of cash or leniency for the informant's own legal difficulties, should further inhibit the flow of information in the underground market, which consists primarily of word-of-mouth within social networks. Providing informants with incentives might also reduce the value of guns to youth for social status, since public display of a firearm would now entail additional legal risk. This type of reward programme has been employed in New York but has to date not been rigorously evaluated (Golden and Almo, 2004). In Boston, law enforcement efforts focusing on the illegal diversion of handguns from retail sources reduced the prevalence of new handguns recovered in crime (Braga and Pierce, 2005).

A. Crime Gun Traces

We draw on data from the Bureau of Alcohol, Tobacco and Firearms (ATF) on crime guns confiscated by the Chicago Police Department between 1999 and 2003 submitted to ATF for tracing. By using serial numbers that are unique to a given gun (conditional on manufacturer), ATF tries to identify the first legal purchaser of the firearm by accessing the commercial transactions records maintained by law by dealers, distributors and manufacturers.

Between 1999 and 2003 the Chicago PD submitted all confiscated crime guns to the ATF for trace requests, as part of ATF's Youth Crime Gun Intervention Initiative (YCGII). A total of 43,413 guns were submitted for tracing over this period, of which 23,237 (53.5%) were successfully traced. This tracing success rate is quite similar for our study area of GB/WP and for the rest of Chicago. This tracing success rate is also quite similar to national data for 1999 (54%). Nationwide in 1999, 10% of guns could not be traced because the guns were too old, while others could not be traced because of problems with the serial number or errors in the paperwork and the like. It is important to note that even when guns are successfully traced this process can only identify the first purchaser from a FFL, and provides no information on subsequent transactions in the underground distribution chain; see Cook and Braga (2003) for more on the trace process and limitations of the ATF data.

B. Arrest Data

Our arrest data consists of a census of all arrests made in the state of Illinois from 1990 to 2001 reported to the ISP. These data provide information on the date of each arrest, the arresting agency (so that we can distinguish arrests in Chicago versus elsewhere in the state, but cannot determine where within Chicago a crime was committed), all criminal charges filed against the suspect as part of the arrest, and (albeit with some additional measurement error) the disposition of these charges.

C. UCR Crime Data

To measure gun involvement in crime in Chicago and other cities we use standard data from the FBI's Uniform Crime Report (UCR) system. These data capture crimes voluntarily reported by victims to the police and then voluntarily submitted by police to the FBI. Problems with the UCR data in terms of variation across areas and time in victim reporting to police and police reporting to the FBI are well known; see for example Maltz (1999). However the UCR data are generally believed to be more reliable for more-serious than for less-serious offences.

D. Vital Statistics

To measure gun ownership rates we use data from the Vital Statistics (VS) census of all deaths to construct a measure of the fraction of suicides within a jurisdiction that is committed with firearms (firearm suicides divided by suicides, or FSS). While the VS is generally thought to capture most deaths that occur in the US, one source of measurement error comes from the fact that coroners or medical examiners report the cause of death on the death certificate, which may disagree with the results of subsequent police investigations and more generally can be subject to some ambiguity. (For example, when the beat-era writer William S. Borroughs famously tried to shoot an apple off of his wife's head but missed and killed her instead the medical examiner handling the case may plausibly have had some doubts about whether to classify this as an accident, homicide or, from the perspective of Borroughs' wife, suicide at least in a probabilistic sense). The fraction of suicides that involve a firearm has been shown to be strongly correlated

with survey-based measures of household gun ownership rates in the cross-section (Azrael *et al.*, 2004) and within states or regions over time as well (Cook and Ludwig, 2006*a*).

E. Drug Use Forecasting Data

The Drug Use Forecasting (DUF) system was administered by the US Department of Justice and has collected survey information on arrestees from 1987 through 1997. (The successor to the DUF is called the ADAM, which was itself recently discontinued.) Usually the sample includes arrestees from 24 different US cities, although sites vary somewhat from year to year. Within participating cities, first a set of selected booking facilities are selected and then arrestees within these booking facilities are asked to be interviewed. In Chicago and 10 other DUF sites (Atlanta, Cleveland, Denver, Detroit, Houston, Kansas City, Omaha, Philadelphia, St. Louis and Washington, DC) the catchment area for selecting booking facilities was the city. In the other DUF sites (Dallas, Ft. Lauderdale, Indianapolis, Miami, New Orleans, Manhattan, Phoenix, Portland, San Antonio, and San Jose) booking facilities were selected from catchment areas defined by borough, county or parish. Each site attempted to collect data from around 225 adult males per quarter and 100 adult females. Some (but not all) sites also attempted to collect data from 100 juvenile males and 100 juvenile females.

Typically around 90% of arrestees asked to participate agreed to answer survey questions about drug use and involvement with crime, while 80% agreed to provide urine samples for drug testing. These sources of data are complemented by administrative data from police arrest records regarding the arrestee's demographics (age, race) and the crime for which the person was arrested.

In 1995, 1996 and 1997 the DUF survey included a gun addendum that asked survey respondents to report on their experiences with guns, including ownership, gun use in the most recent crime, acquisitions, victimisation experiences and general availability in the community. Because these data were collected for only the second half of 1995 we focus our analysis on data from 1996 and 1997. The DUF data used in our analyses are restricted-use and obtained under a special agreement with ICPSR. For more information about the dataset see the documentation for ICPSR study number 9477.

Table A1

Type of Crimes Leading to Gun Confiscation in Chicago, by Age of Possessor

	Grand Boulevard/Wash Park			Other Chicago Neighbourhoods		
Recovery crime type	Juvenile (<18) %	Youth (18–24) %	Adult (25+) %	Juvenile (<18) %	Youth (18–24) %	Adult (25+) %
Firearms offence	50.0	39.4	37.0	57.8	51.1	51.0
Narcotics crime	43.6	50.6	49.6	24.8	33.8	33.1
Violent crime	5.1	8.3	11.1	13.7	11.6	10.8
Other crime	1.3	1.7	2.3	3.6	3.6	5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
(Number)	(78)	(348)	(395)	(548)	(2,432)	(3,252)

Source. See Table 1

Violent crime = homicide, robbery, assaults, kidnapping, sex crimes (i.e. rape/assault); Narcotics crime = drug offences not distinguished by possession, sales, or type of drug; Other crime = burglary, theft, fraud, explosives, vice crimes, integrity crimes, etc.; Firearms offence = illegal carrying or possession of a firearm (carrying and possession are not distinguished in the data).

Table A2

Source States of Guns Confiscated in Chicago

	Grand Blvd/Wash Park (%)	Rest of Chicago (%)
State		
Illinois	46.2	48.3
Indiana	11.5	11.6
Mississippi	10.9	9.6
Wisconsin	3.4	2.8
Georgia	2.4	1.8
Arkansas	2.3	1.8
Kentucky	2.3	2.5
Alabama	2.0	1.8
Texas	1.9	2.0
Tennessee	1.7	2.2
Other	15.4	15.6
Total	100.0	100.0

Source. See Table 1.

Table A3

Type and Calibre of Guns Confiscated in Chicago

	Grand Blvd/Wash Park (%)	Rest of Chicago (%)
Number	4,483	38,930
Type of firearm		
Semiautomatic Pistol	49.0	50.2
Revolver	34.6	33.0
Shotgun	7.7	7.9
Rifle	7.2	7.0
Derringer	1.5	1.6
Other	0.1	0.2
Total	100.0	100.0
Caliber/Gauge		
9 mm	18.7	18.0
.38	15.9	15.5
.22	11.4	12.9
.380	10.4	11.2
.32	7.5	6.7
.25	7.2	8.4
.357	6.9	6.5
.45	5.5	4.7
12 gauge	5.4	5.7
.40	2.5	2.1
Other	8.7	8.3
Total	100.0	100.0

Source. Authors' calculations of guns submitted by Chicago Police Department to ATF for tracing in 1999–2003 (see Appendix).

Table A4

Retail Price and Age of Guns Confiscated in Chicago

	Grand Blvd/Wash Park			Rest of Chicago		
	Juveniles (under 18)	Youth (18–24)	Adults (25+)	Juveniles (under 18)	Youth (18–24)	Adults (25+)
Number	72	301	293	484	2,055	2,525
Retail Price						
Mean	$294	$312	$326	$297	$316	$350
Median	$173	$311	$400	$269	$303	$410
Price Distrib	%	%	%	%	%	%
<$150	43.1	28.9	30.0	35.5	30.5	23.7
$150–300	11.1	20.9	16.0	17.9	19.4	17.2
$300–450	15.2	23.5	23.5	19.4	21.7	25.0
$450–600	29.2	24.9	29.4	26.2	26.3	31.2
>$600	1.3	1.7	1.0	0.8	2.1	2.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
Age of gun	%	%	%	%	%	%
< = 3 years	18.2	22.3	25.6	18.4	25.7	24.0
4–7 years	27.3	19.8	20.2	23.2	20.4	23.3
8–12 years	10.9	17.8	15.5	17.6	17.1	16.7
13–19 years	10.9	11.6	6.2	10.1	11.2	9.1
20 + years	32.7	28.5	32.5	30.7	25.6	26.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source. See Table 1. 'Retail price' is estimated price of gun sold new at retail from Blue Book figures, and does not account for actual condition of gun, which is not available in the ATF data.

Duke University and NBER
University of Chicago and NBER
Columbia University
Harvard University

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